A hard test?

Water you talking about?

You'll just have to wade and sea!

Instructions: Be sure to read the instructions for each of the individual sections. The instructions are specific to the question type found in each section. Each infringement of specific instructions will result in a 3-point deduction. You MAY write on this test; however, anything written on this test form will NOT be graded. Only your answer sheet will be graded. Write your answer for Multiple Choice and Matching in capital letters. That makes it far easier to grade.

Good luck! ☺

(You may need it.)

Team Name: _____

Team Number: _____ C

Team Members: _____ _____

Part I (60 points): Multiple-Choice Multiple-Choice--Choose the best answer(s). **There may be more than one correct answer to each question. There may also be no answer. Select *ALL* correct answers. If you believe no answer is correct, write in "E."** All correct answers must be chosen or else points will not be awarded. Partial credit will not be given. Each question is worth 2 points. **Write your answer on the answer sheet.**

1. This occurs in a braided stream:
    a. Increased river velocity
    b. Bar formation
    c. Deposition
    d. Sorting of sediment

2. Which of the following is the sinuosity of a river?
    a. actual path length/shortest path length
    b. sin(length of channel/width of channel)
    c. the number of meanders in a given length of the river
    d. channel length/valley length

3. Which is a characteristic of a sinkhole?
    a. A natural depression in the Earth's surface
    b. Igneous rock
    c. Granite rock
    d. Limestone

4. What is a difference between a delta and an alluvial fan?
    a. A delta is formed when a river emerges from a mountainous region and flattens suddenly, causing the sediment to be deposited, while alluvial fans form when the river velocity slows at the mouth of the river and sediment is deposited.
    b. A delta is formed when the river velocity slows at the mouth of the river and sediment is deposited, while alluvial fans form when a river emerges from a mountainous region and flattens suddenly, causing the sediment to be deposited.
    c. A delta is an erosional feature, whereas an alluvial fan is a depositional feature.
    d. A delta is a depositional feature, whereas an alluvial fan is an erosional feature.

5. Which of the following is true of porosity?
    a. It depends on grain size of sediments
    b. Poorly sorted sediments tend to have a higher porosity
    c. It determines how much water a rock or sediment can contain
    d. The measurement of porosity ranges from 0-1

6. What is true of capillary fringe?
    a. This layer is located directly below the surface of the ground.
    b. The "fringe" is created when water infiltrates the soil.
    c. The capillary fringe layer only exists shortly after precipitation occurs.
    d. The primary force that causes this phenomenon is capillary action.

7. In which of the following locations are karst features found?
    a. Pennsylvania
    b. Kentucky
    c. Florida
    d. Alaska

8. What is true of suspended load?
    a. This is used to describe the dissolved ions that are carried in solution in a stream or river.
    b. This is used to describe the sediment that is carried by the flow of a river and almost never touches the river bed.
    c. It is generally comprised of particles of fine sand, silt, or clay.
    d. It is generally comprised of Na^+, K^+, and PO_4^{3-}.

9. What is true of a bog?
    a. Peat is uncommon in bogs
    b. The water tends to be basic
    c. They form by paludification
    d. They form by terrestrialization

10. What is the difference between a parallel drainage pattern and dendritic drainage pattern?
    a. Parallel is sometimes indicative of an underlying fault
    b. Dendritic indicates that there are rock bands of different densities (aka, not homogeneous) underneath the river
    c. Dendritic is found where there is a discernable slope to the surface
    d. Parallel tends to be more common

11. What is the force between groundwater and the surface of rocks/sediment (due to ions on the surface of mineral grains)?
    a. capillarity
    b. London dispersion forces
    c. capillary tension
    d. force of molecular attraction

12. What meander-formation-related phenomena occur in meandering streams?
    a. condensation
    b. evaporation
    c. evapo-transpiration
    d. fog drip

13. An aquifuge is:
    a. More permeable than an aquiclude
    b. Less permeable than an aquifer
    c. Less permeable than an aquitard
    d. Another word for artesian well

14. The following are often found in rocks that form karst formations:
    a. NaCl
    b. $CaSO_4$
    c. $CaCO_3$
    d. NH_4

15. The following are compounds that weather rocks to form karst formations:
    a. Sulfuric Acid
    b. Calcium Hydroxide
    c. Carbonic Acid
    d. Sodium Hydroxide

16. The Continental Divide/Great Divide is:
    a. A boundary that separates climate types.
    b. A boundary that shows the separation of water flowing into the Atlantic Ocean from water flowing into the Pacific.
    c. A boundary that separates two continents.
    d. A boundary that separates two drainage basins.

17. Where is the water fastest in a meandering stream?
    a. At the surface of the water
    b. Right below the surface of the water
    c. Along the sides of the channel

d. At the very bottom of the channel

18. Which of the following are characteristic of low-order streams?
    a. No flood-plain/little flood plain
    b. High gradient
    c. Mostly erosional action (not much depositional action)
    d. High stream load

19. What is formed when a meander is cut off from the rest of the river?
    a. Bar
    b. Oxbow Lake
    c. Billabong
    d. Isolated Lake

20. Which of the following occur when a lake undergoes turnover?
    a. The water throughout the lake mixes
    b. The water at the very bottom of the lake remains dense and cold
    c. The water becomes a uniform temperature
    d. Thermocline disappears

21. Which of the following **directly** affect the rate of transportation or deposition of sediment in rivers?
    a. sediment size
    b. river gradient
    c. rate of erosion
    d. river velocity

22. All of the following are examples of point-source contaminants **except** for:
    a. Industrial facilities dumping waste
    b. Bacteria and nutrients from livestock, and pet wastes
    c. Drainage outlet delivering polluted runoff
    d. Fertilizers, herbicides and insecticides from agricultural lands and residential areas

23. Stream capacity is dependent on:
    a. Type of rock that composes the river channel
    b. Volume of the river
    c. Wetted perimeter of the river channel
    d. Velocity of the river

24. Stream competence is dependent on:
    a. Type of rock that composes the river channel
    b. Volume of the river
    c. Wetted perimeter of the river channel
    d. Velocity of the river

25. Which of the following ions comprise the majority of dissolved load of a stream?
    a. Cu^{2+}
    b. Mn^{2+}
    c. S^{2-}
    d. PO_4^{3-}

26. The following are all examples of nickpoints **except**:
    a. lake
    b. cascade waterfall

c. fault
d. fan waterfall

27. What is true of a stream at its base level?
    a. Erosional forces are greater than depositional forces
    b. Depositional forces are greater than erosional forces
    c. The river velocity decreases considerably
    d. The river velocity increases considerably

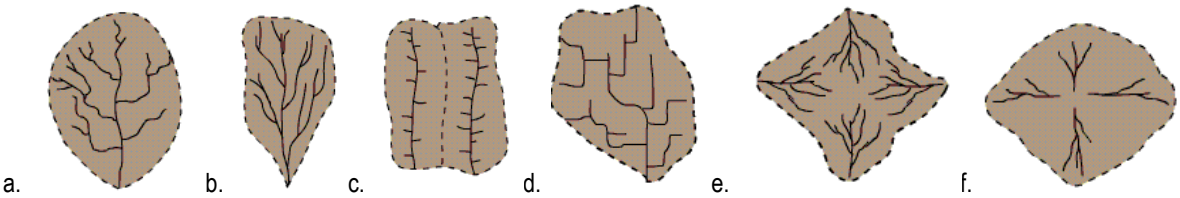
28. Flocculation and coagulation are both methods that can be used to purify water. What is the difference between the two?
    a. Flocculation is a chemical process, and coagulation is a physical process.
    b. Flocculation tends to deal with removing unwanted ions while coagulation removes sediments.
    c. Flocculation tends to deal with removing sediments while coagulation removes unwanted ions.
    d. Flocculation destabilizes colloids by neutralizing forces that keep them apart, whereas coagulation clumps the resultant "flocs" together.

29. Which of the following tools can be used to measure turbidity of water?
    a. Secchi Disk
    b. Peterson Grab
    c. Nansen Bottle
    d. Nephelometer

30. What is a major result of urban development?
    a. Less runoff
    b. More impervious surface
    c. Flooding
    d. More runoff

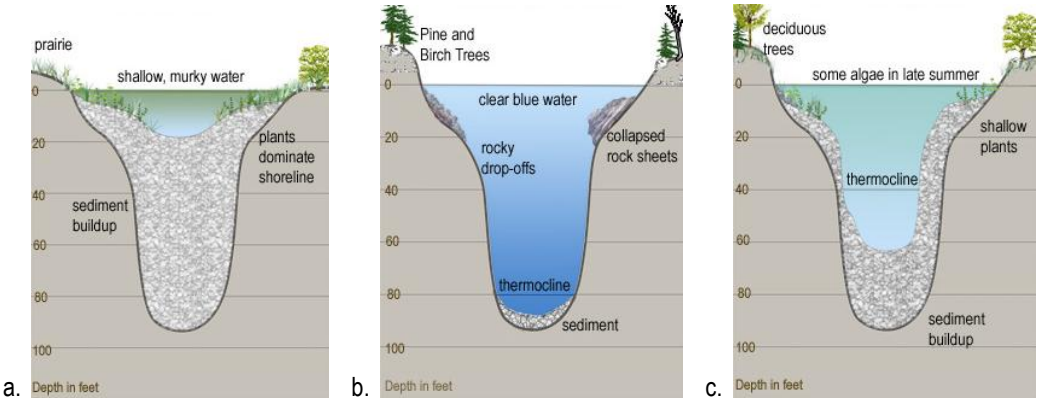
Part II (40 points): Matching--Choose the best answer(s). **There may be more than one correct answer to each question. There may also be no answer. Select *ALL* correct answers. If there is no correct answer, write in "No answer."** All correct answers must be chosen or else points will not be awarded. Partial credit will not be given. Each question is worth 2 point. **Write your answer on the answer sheet.** Each answer may be used more than once.

Matching: Part A; Look at the following drainage patterns. Use the letters to answer the following questions.



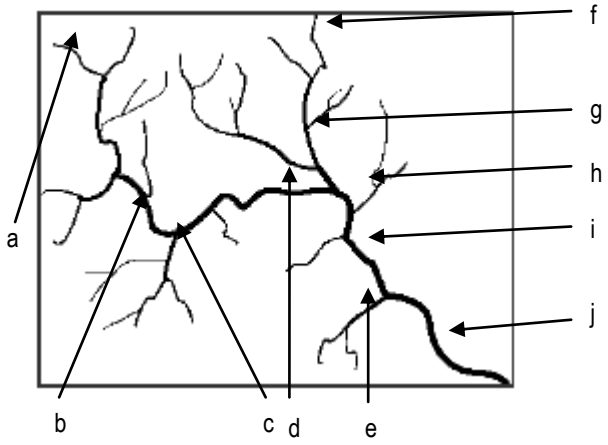
1. Indicates underlying material is homogeneous:
2. Formed in a mountainous area:
3. Most common pattern:
4. Rectangular drainage pattern:
5. Found in areas that have undergone faulting:

Matching: Part B; Look at the following profiles of lakes. Use the letters to answer the following questions.



6. Represents an oligotrophic lake:
7. Represents a hypereutrophic lake:
8. Represents a mesotrophic lake:
9. Contains some nutrients:
10. May very soon undergo terrestrialization:

Matching: Part C; Look at the following diagram of a river. Using the Strahler stream order classification system, answer the following questions.



11. Represents a first-order stream:
12. Represents a fifth-order stream:
13. Represents a third-order stream:
14. Represents headwaters:
15. Represents the main channel:

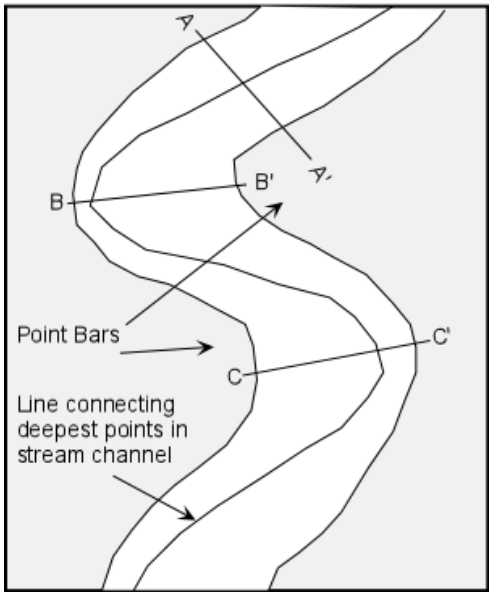
Matching: Part D; Look at the following rivers. Use the letters to answer the following questions.

a.  b.  c. 

16. Has the lowest velocity:
17. Mostly turbulent flow:
18. Mostly laminar flow:
19. Has both depositional and erosional forces:
20. Final stage of a straight channel:

Part III (20 points): Fill-in-the-Blank. Fill in the blanks with the correct response. Each question is worth 1 point. **Write your answer on the answer sheet.**

1. The property of rock allowing water to pass through is called _____.
2. The part of the stream discharge that is not attributable to direct runoff from precipitation or melting snow is known as _____.
3. The emergence of groundwater at the land surface, usually at a clearly defined point is known as _____.
4. The process of adding water to an aquifer is known as _____.
5. _____ is the process by which soluble materials in the soil, such as salts, nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water
6. The equation describing the flow of a fluid through a porous medium is known as _____.
7. _____ water is mixed salt and fresh water.
8. The vertical distance between the water level in a well before pumping and the water level in the well during pumping is known as _____.
9. A stream that receives groundwater discharge is known as a(n) _____ stream.
10. A(n) _____ diagram shows the relationship between sediment size, velocity of the river, and whether the sediment is being deposited, transported, or eroded.
11. The three types of load carried by a river are suspended load, dissolved load, and _____ load.
12. Pure water reaches its maximum density at _____ ^{o} centigrade.
13. In a lake, the layer of water with a dramatic change of temperature is known as the _____.



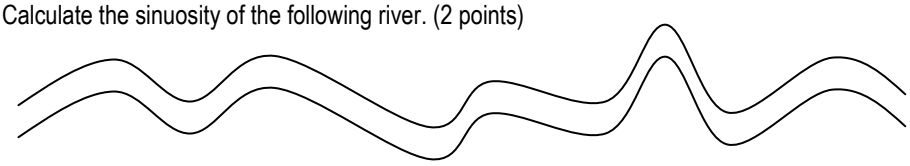
For # 14-15, refer to the diagram to the left.

14. This is a diagram of a(n) _____ channel.
15. The line connecting the deepest points in the stream channel is known as the _____.
16. Stream flow in which all water molecules travel in roughly parallel paths is known as _____ flow.
17. The process in the water cycle that causes cloud formation is called _____.
18. The falling of small particles and gases to the earth without rain or snow is known as _____.

19. An area of land over which all the precipitation drains to the same point is known as a(n) _____. This area is bounded by a drainage divide.
20. The imaginary line which divides the saturated zone and unsaturated zones: _____.

Part IV (10 points): Calculations. Do the following calculations. Show all work. Point values are shown. **Show your work and write your answer on the answer sheet. Circle your final answer. You will get points for having the correct formula written down, so WRITE DOWN THE CORRECT FORMULA.**

1. Calculate the sinuosity of the following river. (2 points)



Scale: 1 mile = |----------|

2. The following calculations deal with flood recurrence intervals. (4 points)
    a. What is the probability that a 100-year flood will be exceeded in the next 70 years?
    b. What is the recurrence interval of a flood that occurs three times in the record, when data has been collected for 50 years?
3. The following calculations deal with Manning and Chézy equations. (4 points)
    a. Calculate the Manning coefficient of roughness given the following information:
        - Elevation at Point A: 160 meters
        - Elevation at Point B: 120 meters
        - Distance between Point A & Point B: 80 meters
        - Cross sectional average velocity = 59.074 meters/second
        - Cross sectional area of the channel: 40 meters^2
        - Wetted perimeter: 8 meters
    b. Calculate the Chézy coefficient of a river given the following information:
        - Manning coefficient of 0.050
        - Slope of .8
        - Hydraulic radius of 10 meters

Part V (20 points): Extended Response. Give complete answers to each of the following questions. Answer ALL parts of the question. Each question is worth 4 points. **Write your answer on the answer sheet.**

1. Describe the **primary** chemistry involved with karst formations. (Hint: Use chemical formulas and equations if relevant and look at #14-15 in the multiple choice section)
2. How does a lake form from a glacier?
3. Explain the processes in the hydrological cycle.
4. Describe the formation of a waterfall.
5. Describe a dimictic lake, and the turnover it experiences.

Unrelated bonus! (0.5 points, but 100000000 respect points) Who is the singing voice of Jasmine in Disney's Aladdin and the voice of Fa Mulan in Disney's Mulan? Write your answer in big letters at the very bottom of the last page of your answer sheet.

DYNAMIC PLANET – ATHENS INVITATIONAL 2012

Team #: _____ School: _____ Participant Names: _____

Part I: (60 points; 2 points each) Multiple Choice. Write the correct answer in the blanks below. **Anything written on the test will not be graded**.

1. _____
2. _____
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25. _____
26. _____
27. _____
28. _____
29. _____
30. _____

Part II: (40 points; 2 points each) Matching. Write the correct answer in the blanks below. **Anything written on the test will not be graded**.

1. _____
2. _____
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16. _____
17. _____
18. _____
19. _____
20. _____

Part III: (20 points; 1 point each) Fill-in-the-blank. Write the correct answer in the blanks below. **Anything written on the test will not be graded**.

1. _____
2. _____
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13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Part IV: (10 points) Calculations. Show all work. **Circle your final answer and write down the correct formula(s).**

1. Formula: _____
   Work:

   Final Answer:

2a. Formula: _____
   Work:

   Final Answer:

2b. Formula: _____
   Work:

   Final Answer:

3a. Formula: _____
   Work:

   Final Answer:

3b. Formula: _____
   Work:

   Final Answer:

Part V: (20 points; 4 points each) Extended response. Write the correct answer in the blanks below. **Anything written on the test will not be graded**.

1. _____

2. _____

3. _____

4. _____

5. _____

Answers:

Part I:

1. B,C,D
2. A,D
3. A,D
4. B
5. A,B,C,D
6. D
7. A,B,C,D
8. B,C
9. C,D
10. A
11. D
12. E
13. B,C
14. C
15. A,C
16. B,D
17. B
18. A,B,C,D
19. B,C
20. A,C,D
21. A,D
22. B,D
23. D
24. D
25. E
26. C
27. B,C
28. E
29. A,D
30. B,C,D

Part II:

1. A
2. B,C,E,F
3. A
4. D
5. D, B (**must** have d, may have b since b is conditional)
6. B
7. none
8. C
9. A,B,C
10. A
11. A,F
12. I,J
13. B,C,G
14. A,F
15. A,B,C,D,E,F,G,H,I,J
16. C
17. A,B
18. C
19. A,B,C
20. C

Part III:

1. permeability
2. base flow
3. spring
4. recharge
5. leaching
6. Darcy's Law
7. brackish
8. drawdown
9. gaining/effluent
10. Hjulstrom
11. bed
12. 4
13. thermocline/metalimnion
14. meandering
15. thalweg
16. laminar
17. condensation
18. dry deposition
19. watershed/drainage basin
20. water table

Part IV:

1. (**1 point**) Sinuosity = river length/valley length
   (**.5 point**) 1.20 (+/- .1)
   (**.5 point**) NO UNITS
2. a. (**1 point**) Probability of equality/exceedance = 1-(1-Probability of event)$^{\#years}$
   or, $P_e = 1-(1-P)^r$ where P_e is the probability that the event will be exceeded/equaled, P is the probability of the event occurring, and r is the time period.
   *Note: P can equal 1/T, where T is the recurrence interval. $P_e = 1-(1-(1/T))^r$ is also acceptable. Also, they can have different variables.
   (**.5 point**) 0.50516
   (**.5 point**) NO UNITS
   b. (**1 point**) Recurrence interval = # of years on the record/# of events
   (**.5 point**) 50/3 or 16.67
   (**.5 point**) years
3. a. (**1 point**) $V = 1.0/n * R^{2/3} * S^{1/2}$ where V = velocity, 1.0 is the SI standard, n is the roughness coefficient, R is the hydraulic radius (cross sectional area/wetted perimeter), and S is the slope
   (**.5 point**) 0.035
   (**.5 point**) seconds/(meter$^{1/3}$)
   b. (**1 point**) $C = 1/n* R^{1/6}$ where C is the Chézy constant, n is the Manning coefficient, and R is the hydraulic radius.
   (**.5 point**) 29.356
   (**.5 point**) (meters$^{1/2}$)/second

Part V:

1. Mention $CaCO_3$, and H_2CO_3. (**1 point**)
   Have $CaCO_3 + H_2CO_3 \rightarrow Ca^{2+} + 2\ HCO_3^-$. (**1 point**)
   Have a brief description of the process (CAN ONLY GET 2 POINTS TOTAL): Carbonic acid forms when carbon dioxide dissolves in water. (**1 point**) Carbonic acid breaks down limestone. (**1 point**). Erosion then moves the products of the chemical reaction, eventually forming karst topography. (**1 point**)
2. Near the end of the last glacial period, glaciers began to retreat. A retreating glacier often left behind large deposits of ice (**1 point**) in hollows between drumlins or hills. (**1 point**) As the ice age ended, these melted to create lakes. (**1 point**) Add another point if no points missed up to this point.
3. Mention condensation, evaporation, precipitation (**1 point**)
   Discuss/Explain condensation, evaporation, precipitation (**1 point**)
   Mention and explain runoff, transpiration, sublimation, collection of water in rivers/lakes/oceans, infiltration/groundwater processes (**1 point each; maximum 2 points**)

4. (**Maximum 4 point limit**) When the river courses over resistant bedrock, erosion happens slowly (**1 point**), while downstream the erosion occurs more rapidly (**1 point; if they explain both this and the previous point, add a point**). As the watercourse increases its velocity at the edge of the waterfall, it plucks material from the riverbed (**1 point**). The water carries away the eroded sediment (**1 point**).
5. (**Maxmimum 4 point limit**) Dimictic lakes experience turnover twice a year during the fall and spring seasons. (**1 point**) During these times, the water is able to freely circulate from the surface to the floor (turnover). (**1 point**) During the rest of the year, the water column separates into layers based on water density (stratification). (**1 point**) Stratification of lakes results in three layers; epilimnion, metalimnion/thermocline, hypolimnion. (**1 point**) Water is most dense at 4^{o} C. (**1 point**) During the fall, the warm surface water begins to cool. As water cools, it becomes more dense, causing it to sink. This dense water forces the water of the hypolimnion to rise. (**1 point**) During spring turnover, the top layer of water on the lake gets warmed by the sun which then matches the temperature of the rest of the lake water. Then the spring wind picks up and the lake mixes . (**1 point**)

[UPLOADER'S NOTE: THE ANSWER TO THE "UNRELATED BONUS" IS LEA SALONGA. JUST IN CASE YOU WANTED TO KNOW. :)]